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(71) Applicant (*for all designated States except US*): 3NINE AB [SE/SE]; P.O. Box 1163, S-131 27 Nacka (SE).

(72) Inventor; and

(75) Inventor/Applicant (*for US only*): SANDGREN, Martin [SE/SE]; Riddargatan 25, S-114 57 Stockholm (SE).

(74) Agent: ALBIHNS STOCKHOLM AB; P.O. Box 5581, Linnégatan 2, S-114 85 Stockholm (SE).

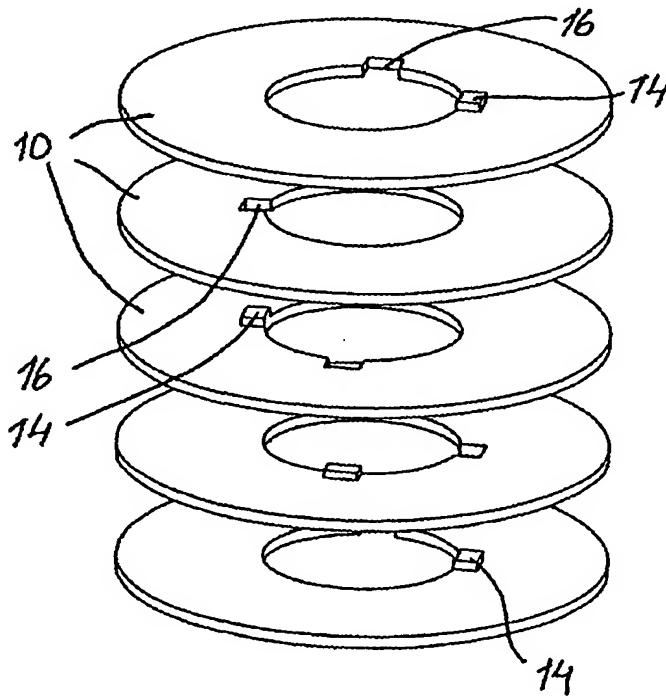
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## Published:

— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: ROTATION BODY ARRANGEMENT



(57) Abstract: The invention relates to an arrangement comprising a rotational body rotatable about a longitudinal centre axis and composed of a plurality of identical adjacent elements (10). The elements are fixed relative to each other in the circumferential direction and are separated axially. For balancing of the rotational body, the elements (10) each have, on one side, an axially directed projection (14) and, on its reverse side, a notch (16), which is angularly displaced a certain amount from the projection (14) in the circumferential direction of the element.

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**ROTATIONAL BODY ARRANGEMENT****Technical field**

5 The present invention relates to an arrangement of a rotational body and in particular to an arrangement comprising a rotational body rotatable about a longitudinal centre axis and composed of a plurality of adjacent elements, where said adjacent elements are circumferentially fixed and axially separated. Examples of such a rotor are a fan, a pump, a centrifugal separator, a turbine or the like.

10

**Background of the invention**

When assembling rotors, e.g. centrifugal separators, normally many identical disc-shaped separation elements are stacked with a small distance between them. The 15 discs, which are substantially rotationally symmetrical and can be of metal or plastics material, usually have inherent small manufacturing tolerance defects, which can cause imbalance to occur in the assembled rotational body. It is essential, for example, for reliable functioning that the rotational body composed of the elements is in precise balance both statically and dynamically. To achieve such good balance, 20 a very narrow manufacturing tolerance is required for each individual element, which is expensive. Alternatively, after-balancing is required of such a rotational body, which is both time-consuming and expensive.

**Purpose and solution of the invention**

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A primary purpose of the present invention is to achieve an arrangement of the type described by way of introduction, in which the need is removed for after-balancing of the rotor due to the manufacturing tolerances of the individual elements.

For this purpose the arrangement according to the invention is characterized in that each of the elements has, on one side, an axially directed projection and, on its reverse side, a notch, which is angularly displaced a certain amount from the projection in the circumferential direction of the element, the projection of each element 5 engaging in the notch of an adjacent element, so that the projections on adjacent elements will be successively displaced in the same circumferential direction with a spacing corresponding to the angular displacement between the projection and the notch in each element. By virtue of the fact that each element when assembled must be rotated a certain angle corresponding to the angle between the projection and the 10 notch of the element, and necessarily in only one circumferential direction, any off-centre deviation of the centre gravity from the centre in the individual elements, caused by constant tolerance error in manufacturing, will be distributed evenly about the rotational body in its circumferential direction. If there is a constant imbalance 15 of the individual discs, it will be evened out against each other and make the entire rotational body balanced.

Additional features of the arrangement according to the invention will be evident in more detail below with reference to the accompanying drawings.

20 **Short description of the drawings**

Fig. 1 is a plan view of a group of disc elements in a rotational body according to the invention;

Fig. 2 is a cross-sectional view taken along the line A-A in Fig. 1; and

25 Fig. 3 is a schematic exploded view in perspective of a set of disc elements arranged in accordance with the present invention.

**Detailed description of the invention**

Fig. 1 shows in schematic form a flat, circular disc element 10 of a rotational body for a centrifugal separator. The disc element 10 can also have another shape, e.g. a 5 conic configuration. Each disc element 10 is provided with a circular centre hole 12. Furthermore, each disc element 10 has a spacer element (not shown) which is intended to maintain a small predetermined axial spacing between disc elements 10 stacked on top of each other in the rotational body (not shown). The disc elements 10 are preferably made of a light plastics material having a projection 14 near the 10 periphery of the centre hole 12 and a notch 16, which is angularly displaced 90° from the projection 14 and is also located along the periphery of the centre hole 12, at the same radial distance from the centre of the disc element 10 as the projection 14. The projection 14 has a shape which securely fits into the notch 16. Even if the 15 notch 16 is shown as a notch which extends through the entire thickness of the disc 10, it is possible that the notch 16 should be made as a non-through hole on the side of the disc element 10 opposite the projection.

By virtue of the fact that the disc elements 10 are made with said angularly spaced 20 projections 14 and corresponding notches 16, it will become necessary, when stacking the disc elements 10, to rotate each successive disc element 90° relative to the preceding disc element, so that the projection 14 on the disc element being applied will engage the notch 16 of the preceding element, as can be seen in Figs. 2 and 3, or vice versa, i.e. that a notch will come into engagement with a corresponding projection. Any imbalance in the individual disc element 10 will thus be evenly 25 distributed circumferentially about the longitudinal centre axis 18 after completed assembly of the four disc elements 10, or a multiple thereof, i.e. 8, 12, 16, 20, 24, etc.

Despite the fact that the projection 14 and the notch 16 in the example shown are 30 angularly displaced 90° on the disc element 10, it is of course possible, within the

scope of the invention, to select another angle within the range of 0-360°. The number of disc elements 10 in a composite rotational body can be selected with advantage so that this number multiplied by the angle between the projection and the notch is 360° or a multiple of 360° to balance out the rotational body, should the 5 centre gravity be displaced from the centre of the individual disc elements, caused by a constant tolerance error when manufacturing the identical disc elements 10.

The projection 14 and the notch 16 (the hole) in the disc elements 10 can be placed at other locations on the disc element than at the inner periphery of the centre hole 10 12. Likewise, the compatible shape of the individual projections and notches can be varied in many ways.

Even though the above detailed description is related to an example where the disc 15 elements form a rotational body for a centrifugal separator, the invention is, of course, not limited to this application but can in general be used in rotors composed of a number of identical components.

## Claims

1. Arrangement comprising a rotational body rotatable about a longitudinal centre axis and composed of a plurality of adjacent elements (10), where said elements are circumferentially fixed and axially separated, characterized in that each of the elements (10) has, on one side, an axially directed projection (14) and, on its reverse side, a notch (16), which is angularly displaced a certain amount from the projection in the circumferential direction of the element, the projection (14) of each element engaging in the notch (16) of an adjacent element, so that the projections on adjacent elements will be successively displaced in the same circumferential direction with a spacing corresponding to the angular displacement between the projection (14) and the notch (16) in each element (10).  
5
2. Arrangement according to claim 1, characterized in that the projection (14) and the notch (16) on each of the elements (10) are located at the same radial distance from the centre (18) of the element.  
10
3. Arrangement according to claim 1 or 2, characterized in that the notch (16) in each element (10) extends through the entire thickness of the element.  
15
4. Arrangement according to one of claims 1-3, characterized in that the number of elements (10) in the rotational body is such that this number multiplied by the angle between the projection and the notch in each element is  $360^\circ$  or a multiple of  $360^\circ$ .  
20
5. Arrangement according to one of claims 1-4, characterized in that the projection (14) and the notch (16) in each element (10) are disposed so that they abut the periphery of the inner centre opening (12) of the element (10).  
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6. Arrangement according to one of claims 1-5, **characterized** in that the elements (10) are disc elements for a centrifugal separator.

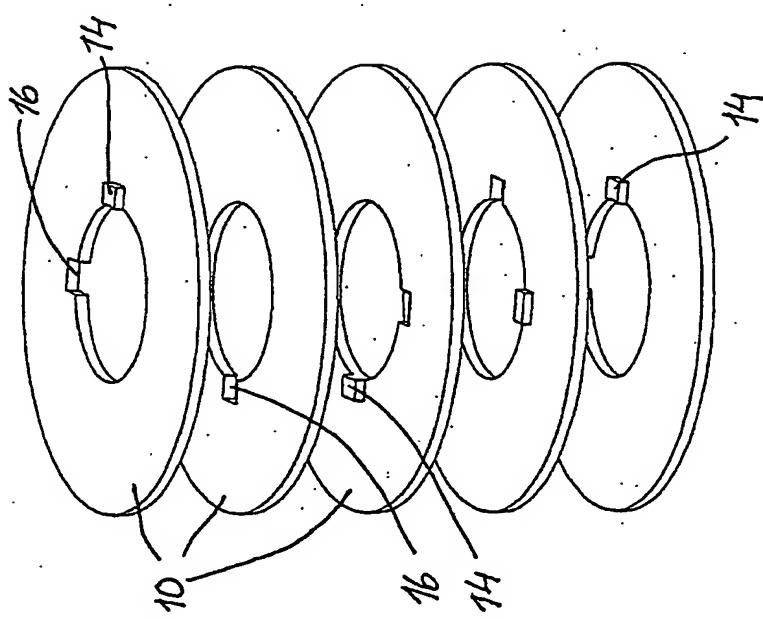


Fig. 3

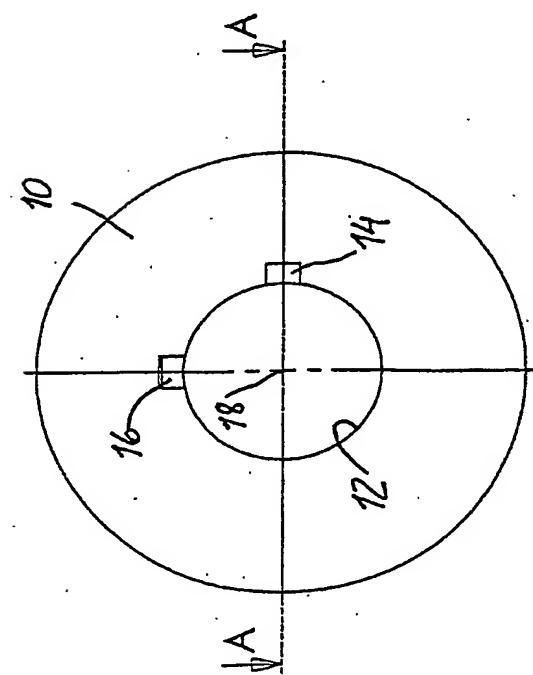


Fig. 1

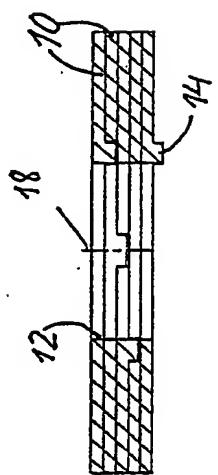


Fig. 2

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/01048

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B04B 7/14, F16F 15/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B04B, F16F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5795477 A (PETER K. HERMAN ET AL), 18 August 1998 (18.08.98), column 15, line 50 - column 16, line 46, figures 19-22, claims 8-15, abstract  -- -----	1-6

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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